Variations of Refractive Index.

EXPERIMENTS conducted in the research laboratory of the firm of Adam Hilger, Ltd., by Mr. G. M. Fleming show that, in certain circumstances, distinct differences of refractive index may occur in certain liquids at the separating surface between the liquid and a polished glass surface. In a few exceptional cases the differences are very great; in the case of ether, for instance, they may amount to as much as 0·02 in the refractive index.

These results appeared to me of considerable importance, and it was intended that the investigations should be continued here.

As a first hypothesis, I proposed to assume that the effect was due to variations of pressure in the neighbourhood of the interface, such variations of pressure being due to cohesion, and occurring according to the intimacy of contact between liquid and glass. Very attractive lines of thought suggest themselves when the phenomenon is contemplated from this point of view.

Unfortunately, more urgent preoccupations intervened, and the results have therefore been communicated to the director of the British Scientific Instrument Research Association, in the hope that he may find a place in the programme of work for further study in this direction. Meanwhile, I should be grateful if any of your readers could refer me to any prior observations of the kind. F. TWYMAN.

Research Department, Adam Hilger, Ltd.,
75A Camden Road, N.W.1, November 7.

The Audibility of Thunder.

FROM reading a recent letter in NATURE (October 16) discussing the distance that thunder can be heard, I am induced to send you the following observation:—On the evening of February 26, 1912, when camped on North Chincha Island (off the west coast of South America), a brilliant display of lightning in the distant high interior to the east attracted our attention. The cloud-stratum from which the storm evidently issued lay far behind the clear coastal zone and the lower foothills, but hid from my camp the upper regions of the Cordillera. Both I and a Peruvian friend heard quite clearly the low distant peals of thunder. As I had been told that thunder was an almost, if not a quite, unknown phenomenon on the coast—this was the first thunderstorm, indeed, that my companion, a man of more than forty years of age, had experienced—I purposely made a record, during the best part of an hour, of the intervals elapsing between the flashes and the peals, and from my journal I find the average to have been 320 seconds. HENRY O. FORBES.

Beaconsfield, Bucks, November 7.

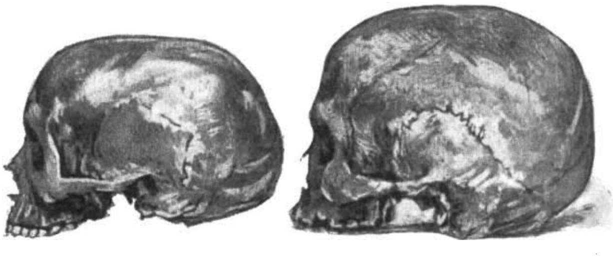
Linkage in the Silkworm: A Correction.

IN referring to Tanaka's work on silkworms I made (NATURE, November 6, p. 216) a mistake which should be corrected. His discovery was not that two characters linked in the male were not linked in the female, but that in a case of linkage common to both males and females it is only in the males that crossing-over occurs. Since, on the analogy of Abraxas, the female is presumably in the silkworm the heterozygous sex, this observation is complementary to and consistent with Morgan's evidence that in Drosophila there is no crossing-over in the male, which in that animal is heterozygous in the sex-character. The paper is in Journ. Coll. Agr., Tohoku Imp. Univ., vii., 1916, pt. 3. Also the forms found by Patterson associated with males and females should have been called "asexual," not "inter-sexes." W. BATESON.

November 14.

THE PREHISTORY OF SOUTH AFRICA.[1]

THE bulk of Dr. McCall Theal's book is as valuable now as it was when first issued, twenty years ago. But though "illustrated and enlarged," it is not "improved" so much as one would have expected. Dr. Theal does not make much use—though he alludes to its publication in 1911—of Dr. Péringuey's important study of the Stone age in South Africa, though the theories of Péringuey and Shrubsall would have materially helped him in his attempts to picture the first peopling of South Africa by Man. Also, in the scanty evidence he has gathered together of the origin and wanderings of the Bushman race he—as do most other historians of Africa—overlooks the statement of the Italian traveller, Ludovico di Varthema, who in his 1508 voyage across the Indian Ocean stopped at Mozambique, and, journeying a short distance inland to some table-topped mountain, described a short-statured savage people living on the mountain-top whose language consisted largely of "clicks," "like the sounds used by Sicilian mule-drivers." I have myself gathered up and recorded legends in South Nyasaland of a yellow-skinned, Bushman-like tribe that lived down to a few hundred years ago on the inaccessible upper parts of Mts. Mlanje and Chiperone.



(a) (b)

FIG. 1.—Drawings of the skulls of two Strandlooper types: (a) the oldest and most like to the Hamite or the Cro-Magnon of Europe; (b) a Strandlooper skull that is very Bushman-like. The originals are approximately the same size.

So far as we can trace the race movements in Africa south of the Zambezi prior to the definite entry of South Africa into recorded history, we find them to be something like this: At a comparatively remote period—say, thirty to twenty thousand years ago—there was living in southernmost Africa a human type now named or nicknamed the Strandloopers ("shore-runners"), whose skulls show a slight resemblance to the Bushman type, but whose brain capacity was much higher (1600–1500 c.c. in the male, compared with an average of 1200 c.c. in the Cape Bushman, and an average of 1480 c.c. in the Bantu-speaking Negroes). The higher type of Strandlooper skull (*a* in Fig. 1) in fact reminds one of the Hamitic skulls of North-east Africa or of the Cro-Magnon type of Europe thirty thousand years or so ago. These scarcely Negroid Strandloopers, according to Péringuey, were the earliest humans in South Africa, so far as our very slight evidence can be applied to the making of theories. But apparently, though they brought with them the European arts of their time, and especially their gift of drawing, they imparted some of these to the Bushman mind and then died out.

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[1] "Ethnography and Condition of South Africa before A.D. 1505." By Dr. George McCall Theal. Second Edition in the Present Form (Illustrated), Enlarged and Improved. Pp. xx+466. (London: George Allen and Unwin, Ltd., 1919.) Price 8*s*. 6*d*. net.

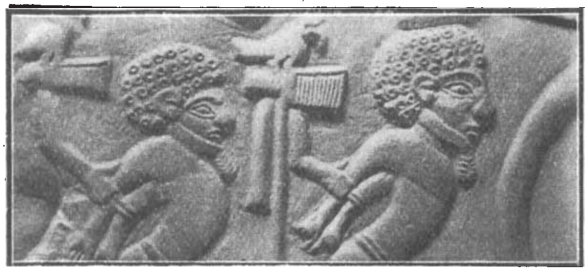

FIG. 2.—A photograph of the Nile Delta pygmy type of (?) 8000 years ago from a pre-dynastic "slate palate."

Another question hinted at, but not adequately discussed, in Dr. McCall Theal's book is that of the different physical types of Bushmen. There is a Bushman language and culture common to all these (degraded or primitive) peoples, but the shape of the head differs considerably. Some—Dr. Theal gives a photograph of a woman—exhibit a greater degree of prognathism than any other known human race. I could supplement Dr. Theal's example by several others, not, unfortunately, at my disposal for reproduction at this moment. The North Kalahari Bushmen have sometimes projecting brows; the Cape Bushmen, on the other hand, are usually neither prognathous nor prominent-browed. Some Bushmen have fairly long skulls; others have head-forms markedly round and brachicephalic. Possibly these varieties in the shape of the skull may indicate a fusion of Negroid types, some of which stood low in the scale of humanity, especially in language. There are apparently two features (besides steatopygy) characteristic of the Bush race which all these varying types hold in common: one is the configuration of the ear, and the other is peculiarities in both the male and female external genitalia. I do not know whether the "Bushman ear" has been definitely noted in other Negro or Negroid races, but the peculiarities of the genitalia can be noted here and there up the eastern side of Africa until the eastern Mediterranean is reached.

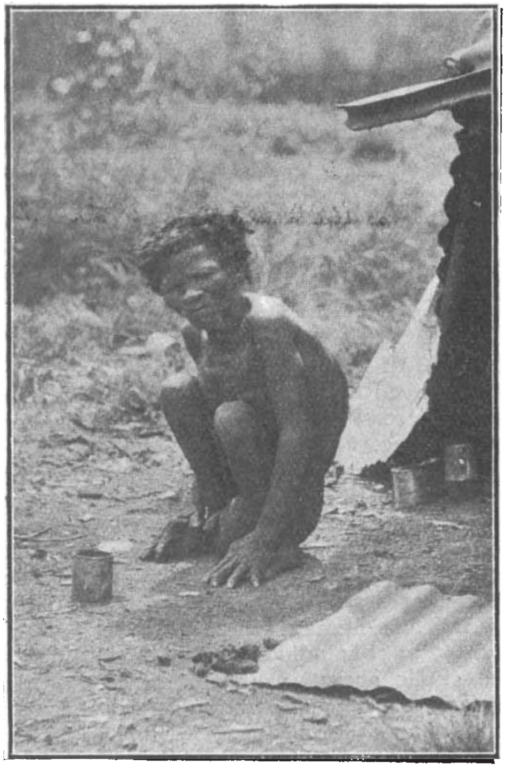

FIG. 3.—A photograph of a very old Cape Bushman.

The Bushmen, indeed, seem to have entered Africa—no doubt very anciently—from the direction of Arabia or Syria, and to have wandered down the eastern side of the continent until they settled in South-east and South-west Africa.

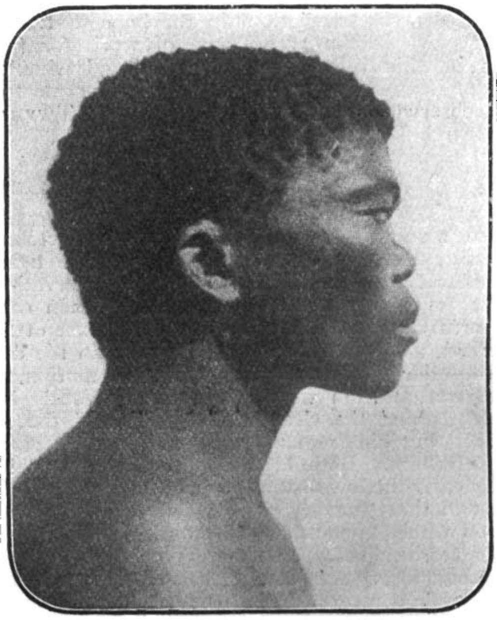

FIG. 4.—Head of a North Kalahari Bushman.

The Hottentots came very much later—the forest Negroes and the Nilotics may have preceded them in East and South-west Africa. They arose probably from a blending somewhere in eastern equatorial Africa between the Bushman type, the Hamitic or Nilotic Negroids, and the forest Negroes. Their push southwards seems to have been diagonal, first from the regions south of the Victoria Nyanza to the Nyasa-Tanganyika plateau, and thence to South-west Africa. Finally, they advanced along the coast of South-west Africa to the lands south of the Orange River. Like the Bushmen, they formed tribes that differed much in facial appearance. Those that the Portuguese and Dutch found established in Cape Colony were lighter in colour and far less ugly than the Hottentots farther to the north-west or inland, and their culture was higher, as though they had preserved more of the Nilotic or Hamitic intermixture.

The pygmies of the Nile Delta, of prehistoric Egypt, seem certainly to have been Negroid, but more like the Asiatic Negroes, and presenting few resemblances to the Bushmen. The steatopygy of Bushmen and Hottentots developed into a local exaggeration (chiefly in the women), but occasionally appears in the Congo pygmies, the East African Bantu, the Nilotic Negroes, and even the Whiteman races of the Mediterranean.

I cannot quite share Dr. Theal's theories concerning the origin of the Bantu languages, but as I have already exceeded the space allotted to me, I must deal with my points of difference elsewhere. On the other hand, I am obstinately in agreement with his views on the subject of the earlier stone buildings of South-east Africa, of the Zimbabwe type; they were never (the earlier and more elaborate) built by Negroes, Bantu or Hottentot; they were—so far as we can be certain on any subject that has not at present conclusive proof—built by a non-Negro people, possibly the Phœnicians coming from some base in southern Arabia. The secondary and much later work was very likely done by Arab gold-seekers prior to the Islamic period. All that the more intelligent Bantu peoples, such as the Karaña or their allies, did on the verge of their entry into the history of South Africa was to carry on very clumsily surface gold-mining and the use of stone for building rough, low walls and circular huts.

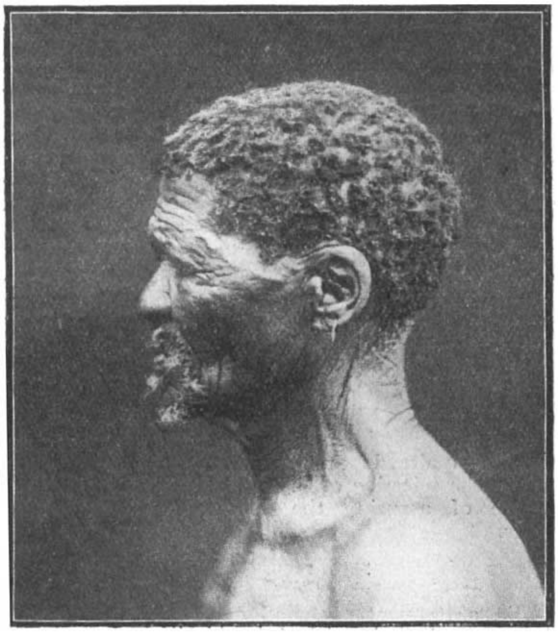

FIG. 5.—Portrait of a Cape Bushman of the orthognathic type.

The accompanying reproductions illustrate my own as well as Dr. Theal's theories. The first is copied from Péringuey and Shrubsall's "Stone Age in South Africa"; the second was given me by Prof. Flinders Petrie; the third by Mr. Leo Weinthal; the fourth is from a photo by Dr. Leonhard Schultz; and the fifth is from the collection of the Royal Anthropological Institute.

H. H. JOHNSTON.

LT.-COL. B. F. E. KEELING.

BY the death of Lt.-Col. Keeling Surveyor-General of Egypt, that country has lost one of its ablest officials. Lt.-Col. Keeling was born in 1880, and educated at Bradford Grammar School and at Trinity College, Cambridge, where he took firsts in the Natural Sciences and Mechanical Science (Engineering) Triposes. On leaving Cambridge he went to the Royal Arsenal, Woolwich, and then to the National Physical Laboratory, where he worked especially on metrology.

In 1904 Keeling joined the Egyptian Survey Department, where he took charge of the major triangulation, and in the next year of the Helwan Observatory also. Here he designed and built the comparator houses for the comparison of the standards of the Survey, and organised the geodetic survey of Egypt, in connection with which a gravity survey of the Nile Valley and neighbouring regions was undertaken. He also started precise levelling in Egypt, and under his direction a network of bench-marks has been formed in the Delta of the greatest value to irrigation. An investigation into the subsoil water-level of the Nile Valley, and its effect on the cotton crop, came also under his direction, while his work on standards of length led to the formation of the Weights and Measures Office under his direction.

In meteorology Keeling introduced research on the upper air at Helwan Observatory, where kites and pilot balloons were regularly used, and in 1908 he made a journey to the Upper Nile for the study of the upper-air currents during the rainy season. In 1913 the more scientific branches of the work carried out in the Survey Department were amalgamated to form the Physical Service, with Keeling as director, and in 1915 this service was transferred to the Ministry of Public Works as a separate Department.

In December, 1914, Keeling left Egypt in order to take up military duties, and received a commission in the Royal Engineers. He was at first attached to the Ordnance Survey, and placed in charge of the map publication department; but it was his keen desire to serve at the front, and in February, 1916, he joined a Field Survey company in France. He was wounded in the autumn of 1916, and did not return to France until 1917, when he commanded first the Depôt Field Survey Company, and then the 3rd Field Survey Battalion; he was promoted to the rank of lieutenant-colonel. The Survey battalions were now organ-